INTRODUCTION

Unifloral False Acacia (Robinia pseudacacia) honey (liquid due to the high fructose content, very light colored and flavored) may easily be adulterated with high-fructose corn syrup (HFCS), negatively influencing market growth by damaging consumer confidence [1].

Aquatronics considers water as a multi-element system that can be described by its multi-dimensional NIR spectra. Since water's H-bonds are present in most natural samples, this analytical approach, using perturbed water in different environments as a mirror for the rest of the molecules in the sample, can be effectively applied to various fields [2].

OBJECTIVE

- Developing an applicable NIR model for screening the adulteration of unifloral Robinia honey using fiber-optic probe.
- Applying recent findings of aquatronics to interpret the chemometrics calibration models for measuring the level of fructose syrup adulteration.
- Extracting important information about the functionality of Robinia honey related to its water structures.

MATERIALS & METHODS

Pure Robinia honey samples
- from four geographic regions of Hungary
- in different periods of False Acacia blossom in 2012.

Isoglucose syrup (High Fructose Corn Syrup, HFCS)
- from high-temperature closed process,
- liquid, cleaned, sterile, ion exchanged and filtered
- 40% fructose, 33% glucose.

Individual honey samples were diluted with HFCS
- random concentrations (n = 40)
- range of honey content = 100-60%
  (honey content mean±SD = 80.79±12.89)

- FOSS NIRSystems 6500 spectrometer (FOSS NIRSystems, Inc., Laurel, MD, USA)
- OptiProbe fiber optic immersion sampling unit, with 2mm layer thickness
- Transflectance spectra, 1100–1800 nm, 2nm step
- Scanning in two rounds, on two successive days
- In random order in both rounds
- Six consecutive spectra for each sample at each time
- Total number of scanned samples: n = 41
- Total number of stored spectra: n = 492

- Data processing with The Unscrambler 9.7 (CAMO Software AS, Oslo, Norway) and MSOffice Excel 2010 (Microsoft Co.)

REFERENCES

[3] Kinoshita et al., 2012. Scientific Reports, 2, 856; DOI:10.1038/srep00856

SUMMARY & CONCLUSIONS

- Quick analytical tests were developed for detecting HFCS adulteration of Robinia honeys.
- The most accurate NIR models for predicting adulteration level with the lowest cross-validation error (RMSE<sub>CV</sub> = 1.48%) were achieved within the whole spectral range of 1300-1800nm, containing the absorption bands of both water and carbohydrates.
- Investigated unifloral Robinia honeys contained larger amount of water having highly organized molecular structure, than industrial sugar syrup (HFCS).

- Larger variety of molecules dissolved in the multicomponent system of honeys
- Simpler molecular structure of HFCS has relatively large amount of unstructured water
- Adulteration caused gradual reduction of water tracers, molecular structures facilitating the interactions with other molecules.